

# **BRaille-CHARACTER DISPLAY DEVICE, AND PORTABLE TERMINAL INCLUDING THE SAME**

## CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority under 35 U.S.C. § 119 to Japanese Patent Application No. 2007-048032, filed Feb. 27, 2007, entitled "BRaille-CHARACTER DISPLAY DEVICE, AND PORTABLE TERMINAL INCLUDING THE SAME." The contents of this application are incorporated herein by reference in their entirety.

## BACKGROUND OF THE INVENTION

### [0002] 1. Field of the Invention

[0003] The present invention relates to a Braille-character display device capable of pressing a plurality of movable pins to represent Braille characters, and a portable terminal including the same.

### [0004] 2. Description of the Related Art

[0005] Recently, there have been commercially available portable terminals such as a mobile telephone, a PHS (Personal Handy-phone System), a PDA (Personal Digital Assistant) and a notebook-sized personal computer. The size and the weight of such portable terminals tends to be reduced. Through a portable terminal, a person with visual impairment can acquire various kinds of information from voice such as conversation and audio guidance.

[0006] In the portable terminal, however, acquisition of information from a conversation or audio guidance requires a sense of hearing. Consequently, a person with visual impairment and hearing impairment can not utilize the portable terminal. In addition, there is a bone conduction technique that allows a person to grasp voice via his/her jaw or cranial bone. However, this technique is adopted for acquisition of information from conversation or audio guidance, but can not be utilized for the purpose of reading data of a character string such as electronic mail and information on the Web.

[0007] In Braille, an aggregate of physically raised dots (a matrix size: 3×2 or 4×2) represents hiragana characters, and a person touches the aggregate with his/her finger to recognize the characters. For example, a person with visual impairment can acquire various kinds of information through such Braille characters.

[0008] Typically, Braille characters are written to a sheet of paper at prescribed spacings, and a user touches raised dots to recognize a word or a sentence. In Braille, however, representation of one hiragana character requires an area of about 25 square millimeters. Consequently, characters equivalent to one novel disadvantageously require a vast amount of paper media. Accordingly, such a paper medium is unsuitable in a case where a user carries a large amount of character data.

[0009] In order to avoid this disadvantage, the following technique is known: Braille-character display parts for displaying eight characters are provided radially on a surface of a disc, and Braille characters are updated successively by a mechanism that protrudes, holds or retreats pins corresponding to dots of the Braille characters. According to this technique, Braille characters are successively displayed by rota-

tion of the disc, so that a Braille-character reading mechanism can be applied to a portable device.

## SUMMARY OF THE INVENTION

[0010] According to an aspect of the present invention, a Braille-character display device includes a movable pin array, a plurality of movable pin pressing parts, a Braille-character generating part and a movable pin controlling part. The movable pin array has a plurality of movable pins arranged in a matrix form. The plurality of movable pin pressing parts presses the plurality of movable pins, respectively. The Braille-character generating part generates Braille characters. The movable pin controlling part allows the movable pin pressing parts to press the movable pins corresponding to a pattern of the generated Braille characters.

[0011] According to another aspect of the present invention, a Braille-character display device includes a plurality of movable pins. The plurality of movable pins are adjusted in height at not less than three levels to form one character.

[0012] According to further aspect of the present invention, a portable terminal includes the Braille-character display device. The portable terminal has portability.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a block diagram showing a hardware structure of a portable terminal according to a first embodiment of the present invention;

[0014] FIG. 2 is an external view showing constituent elements provided on a front face of the portable terminal;

[0015] FIG. 3 is an enlarged external view showing a movable pin array;

[0016] FIG. 4A illustrates a state before a movable pin pressing part presses a movable pin;

[0017] FIG. 4B illustrates a state after the movable pin pressing part has pressed the movable pin;

[0018] FIG. 5 is an external view showing a case where a user utilizes a Braille-character display function of the portable terminal;

[0019] FIG. 6 is a functional block diagram showing schematic functions concerning display of Braille characters on the portable terminal;

[0020] FIG. 7 illustrates the movable pins pressed by the movable pin pressing parts under control by a movable pin controlling part;

[0021] FIG. 8 shows display of Braille characters;

[0022] FIG. 9 is a functional block diagram showing schematic functions concerning display of Braille characters on the portable terminal according to a second embodiment of the present invention;

[0023] FIG. 10 is a functional block diagram showing schematic functions concerning display of Braille characters on the portable terminal according to a third embodiment of the present invention; and

[0024] FIG. 11 shows a conception of a shift of Braille characters by a movement detecting part.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] With reference to the drawings, hereinafter, a detailed description will be given of preferred embodiments of the present invention. In the specification and the drawings, constituent elements having substantially identical functions